



King Saud University  
The Saudi Dental Journal

[www.ksu.edu.sa](http://www.ksu.edu.sa)  
[www.sciencedirect.com](http://www.sciencedirect.com)



## ORIGINAL ARTICLE

# A clinical investigation of the relationship between the quality of conventional complete dentures and the patients' quality of life



Sara A. Alfadda <sup>a,\*</sup>, Hayam A. Al-Fallaj <sup>b</sup>, Hajar A. Al-Banyan <sup>c</sup>,  
Ruba M. Al-Kadhi <sup>c</sup>

<sup>a</sup> College of Dentistry, King Saud University, Riyadh, Saudi Arabia

<sup>b</sup> Department of Prosthetic Dental Sciences, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

<sup>c</sup> College of Dentistry, King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia

Received 11 February 2014; revised 13 August 2014; accepted 13 October 2014

Available online 29 January 2015

## KEYWORDS

Quality of life;  
Complete dentures

**Abstract** *Objective:* The purpose of this study was to determine whether there is a correlation between the clinical quality of conventional complete dentures and patient quality of life.

*Materials and methods:* This study included a random sample of 32 completely edentulous patients (15 males and 17 females) who were treated with conventional complete dentures. Using a validated questionnaire, three investigators evaluated the dentures independently on the basis of seven clinical parameters: esthetics (lip support and lower lip line), retention and stability of the maxillary and the mandibular dentures, and occlusion. Patients completed the validated Oral Health Impact Profile-20 (OHIP-20) questionnaire. Correlations were determined by using the point-biserial correlation coefficient.

*Results:* Clinicians rated the overall clinical quality of the dentures satisfactory in 80.3% of patients. The mean ( $\pm$  standard deviation) total OHIP-20 score was  $56.3 \pm 15.9$  out of a possible 120 maximum. A statistically significant negative correlation was found between the stability of the maxillary and mandibular dentures and the total OHIP-20 score ( $p = 0.009$  and  $0.0023$ , respectively). A negative correlation between the total OHIP-20 score and the retention of the mandibular denture approached significance ( $p = 0.092$ ). Esthetics, retention of the maxillary denture, and occlusion were not correlated with patient quality of life ( $p > 0.169$ ).

\* Corresponding author at: P.O. Box 1914, Riyadh 11441, Saudi Arabia. Fax: +966 1 419 2437.

E-mail address: [salfadda@gmail.com](mailto:salfadda@gmail.com) (S.A. Alfadda).

Peer review under responsibility of King Saud University.



Production and hosting by Elsevier

*Conclusion:* Stability of the maxillary and mandibular dentures is the denture quality parameter that can most significantly affect patient quality of life.

© 2015 Production and hosting by Elsevier B.V. on behalf of King Saud University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## 1. Introduction

The number of geriatric patients throughout the world is expected to increase in the coming decades (Organization, 2003). A substantial number of older patients will likely experience some form of tooth loss, despite efforts to improve preventative dental care programs (Adam, 2006). The World Health Organization considers edentulism to be a form of physical impairment (Organization, 2001) because edentulous patients are impaired, to some degree, in their ability to perform essential life tasks, such as eating and speaking (Brennan et al., 2010).

There have been many studies examining the effect of complete dentures on the quality of life (QoL) of edentulous patients. Allen and McMillan reported an improved health-related QoL among patients who received conventional complete dentures (Allen and McMillan, 2003). Similarly, in a sample of 34 patients, treatment with a conventional complete denture began to improve the oral health-related quality of life (OHRQoL) within a month of insertion and continued to improve the OHRQoL 6 and 12 months after treatment (John et al., 2004). Wearers of complete dentures reported high levels of satisfaction with their daily lives and with their complete dentures (Yoshida et al., 2001). The improvement in the OHRQoL reported by patients did not appear to depend on the technique used to fabricate the conventional complete denture (Ellis et al., 2007).

To the best of our knowledge, no published study to date has investigated how the technical quality of the complete denture, as assessed by the clinician, might affect the patient QoL. Therefore, the current study was performed to determine whether there is a correlation between the quality of the conventional complete denture, defined by specific esthetics and functional criteria, and patient QoL.

The null hypothesis of this study was that the technical quality of the complete denture, as evaluated by the clinician, has no effect on the QoL of the wearer.

## 2. Materials and methods

### 2.1. Patient enrollment and examination

The study was approved by the Human Ethics Board of the College of Dentistry, King Saud University (protocol reference number: NF2400). Power size calculation revealed a sample size of  $N = 22$  for a power of more than 80% to detect a correlation at a significance level of  $\alpha = 0.05$  ( $p < 0.05$ ). Patients ( $N = 32$ ) who were completely edentulous in both jaws and aged 45 years or older were randomly selected from a pool of 92 patients who had been rehabilitated by conventional complete dentures from September 2009 to January 2013. All of the dentures were fabricated by dental students. To achieve external validity, each set of dentures was fabricated by a different clinician.

To be included in the study, patients were required to be: (1) currently wearing the dentures and (2) able to communicate

clearly with the clinician. Patients were excluded if they had physical and/or psychological disorders that precluded clinical examination and the completion of questionnaires. The study protocol was discussed in detail with the patients, and an informed, witnessed, and signed consent was obtained.

The clinical examination was performed by three independent clinicians. A validated clinical examination form was developed to assess the existing dentures objectively, on the basis of a detailed examination procedure. The clinical examination form included seven criteria: (1) esthetics (lip support and lower lip line) (Brunton and McCord, 1993), (2) retention of the maxillary and mandibular dentures, (3) stability of the maxillary and mandibular dentures, and (4) balanced occlusion (Watt and MacGregor, 1976; Heartwell and Rahn, 1986; Barrett, 1978; Bernier et al., 1984). All of the clinical parameters have been described precisely and were evaluated on a dichotomous scale (satisfactory = 1 and unsatisfactory = 0). The minimum score possible for an individual subject was zero and the maximum score possible was seven. The coefficient of internal consistency (Cronbach alpha) of this form was 0.69, indicating acceptable reliability.

Following the completion of the clinical examination, patients were asked to complete a modified short version of the Oral Health Impact Profile for assessing health-related quality of life in edentulous adults (OHIP-20) (Allen and Locker, 2002). This questionnaire contains 20 items, which were designed specifically for edentulous patients. The questions cover seven domains: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Responses are scored by a Likert scale, ranging from 1 ("never") to 6 ("all of the time"), with a minimum total score of 20 and a maximum total score of 120. A higher score indicates compromised QoL.

### 2.2. Statistical analysis

Data were analyzed with the Statistical Package for the Social Sciences software (SPSS version 16.0, Chicago, IL, USA). The  $\kappa$  chance-corrected index of agreement was used to assess the degree of intra- and inter-examiner agreement. With the exception of mean scores, all variables (demographic characteristics of participants and the denture quality evaluation scores) were presented as frequencies and percentages. To determine whether there was an association between the denture quality parameters and the OHIP-20 total score, the point-biserial correlation coefficient was used (statistically significant at  $p < 0.05$ ).

## 3. Results

A total of 32 patients (15 males and 17 females) met the inclusion criteria and completed the study successfully (Table 1). The  $\kappa$  chance-corrected index of agreement indicated near perfect agreement between the three clinicians and perfect agreement for intraexaminer reliability (Table 2).

**Table 1** Demographic characteristic of participants.

Characteristics	Number of participants (%) (N = 32)
Gender	
Male	15 (46.9)
Female	17 (53.1)
Educational level	
Illiterate or below high school	10 (31.3)
High school graduate	12 (37.5)
University/graduate/post graduate	10 (31.3)
Perceived health status	
Healthy	14 (43.8)
One medical condition	10 (31.3)
Two medical conditions	4 (12.5)
Three medical conditions	4 (12.5)
Smoking status	
Smoker	14 (43.8)
Nonsmoker	18 (53.8)
History of complete dentures	
Yes	28 (87.5)
No	4 (12.5)

**Table 2** The  $\kappa$  chance-corrected index of agreement for inter-examiner agreement.

Combination	Kappa value*
Examiner1 $\times$ Examiner 2	0.92
Examiner 1 $\times$ Examiner 3	1.0
Examiner 2 $\times$ Examiner3	0.92

\*  $\kappa$  value of 1 indicates perfect agreement.

The mean total score in denture quality evaluations was  $5.63 \pm 1.50$ . Clinicians rated the clinical quality of the dentures as 80.3% satisfactory across the seven items scored. Esthetic quality (lip support and lower lip line) and quality of the maxillary denture (stability and retention) were rated significantly higher than the quality parameters of the mandibular denture (stability and retention;  $p = .0097$ ). Retention of the mandibular denture was the feature rated as unacceptable most frequently by all three clinicians (Table 3).

Table 4 presents the mean scores for each of the questions of the OHIP-20 questionnaires. The mean total score was  $56.3 \pm 15.9$  (range: 36–90). Associations between the various clinical parameters of denture quality and total OHIP-20 scores are presented in Table 5. A lower OHIP-20 score reflects a higher QoL; therefore, a negative correlation between the clinical parameters and the total OHIP-20 score indicates that the parameter has a direct positive effect on patient QoL. Significant negative correlations were observed between the stability of the maxillary and mandibular dentures and the total OHIP-20 score, indicating that patient QoL is positively affected by dentures with more stability ( $p = 0.009$  and  $p = 0.0023$ , respectively). The correlation between the total OHIP-20 score and retention of the mandibular denture was very close to being significant ( $p = 0.092$ ).

#### 4. Discussion

To the best of our knowledge, this is the first study to examine how the clinically evaluated quality of a conventional complete denture might affect the patient QoL, as measured by the

**Table 3** Denture quality evaluation scores.

Denture quality parameter	Number of participants (%) (N = 32)
	Satisfactory rating
Esthetic lip support	31 (96.1)
Esthetic lower lip line	28 (87.5)
Stability of maxillary denture	27 (84.4)
Stability of mandibular denture	25 (78.1)
Retention of maxillary denture	27 (84.4)
Retention of mandibular denture	12 (37.5)
Occlusion	30 (93.8)
Mean across all seven quality items	NA <sup>¥</sup> (80.3)

\* Percentages are based on the number of participants for whom the clinician provided a rating.

¥ NA: not applicable.

OHIP-20. On the basis of our results, the null hypothesis (i.e., that there is no correlation between the technical quality of complete dentures and the patients' QoL) was rejected.

The health status of patients in this study and their experience with the complete dentures are similar to those in previously published studies, suggesting an appropriate sample selection process (Awad et al., 2003; Wolff et al., 2003; Anastassiadou and Robin Heath, 2006). Stability of the maxillary and mandibular dentures was the factor that contributed most to determining patient QoL. The relationship between mandibular complete denture retention and patient QoL also approached significance ( $p = 0.092$ ). This finding was expected, as retention and stability are interrelated. It is possible that the relationship between retention of the mandibular denture and patient QoL would become significant with an increased sample size.

In general, patients who seek complete denture treatment have lower OHRQoL scores compared to dentate older people and patients receiving different modalities of prosthodontic treatment (Allen and McMillan, 2003; John et al., 2004). This observation can be attributed to the fact that patients with complete dentures usually encounter difficulties in performing home tasks, social work, and leisure activities (Reisine, 1988). Many studies have shown that providing conventional complete dentures to edentulous patients can improve their appearance, chewing ability, social function, and OHRQoL (Agerberg and Carlsson, 1981; Carlsson, 1998; Allen and McMillan, 2003; Adam, 2006). More specifically, stable conventional complete dentures that allow patients to achieve a satisfactory chewing capacity have a positive impact on their QoL (de Souza e Silva et al., 2009). Conversely, an ill-fitting denture negatively affects the patient's ability to eat, talk, and smile freely (Sheiham and Croog, 1981).

Therefore, clinicians should effectively utilize the biomechanical considerations that influence denture stability, such as muscle tonus, neuromuscular coordination, and tongue, cheek, lip, and jaw to fabricate conventional complete dentures (Chaytor, 2004). In cases of severe resorption of the alveolar ridge, preprosthetic surgery (e.g., sulcus deepening, vestibuloplasty, and ridge augmentation) can be used to provide an optimized denture-bearing area. However, due to the introduction of dental implants, this procedure is not as commonly used. The body of evidence regarding the efficacy of implant

**Table 4** The OHIP-20 scores.

Have you had...?	N (%) of patients						Mean $\pm$ SD <sup>¥</sup>
	Always	Very often	Often	Occasionally	Rarely	Never	
Difficulty chewing any foods because of problems with your teeth, mouth or dentures?	7 (21.2)	5 (18.2)	3 (9.1)	2 (6.1)	4 (12.1)	11 (33.3)	3.3 $\pm$ 2.05
Trouble pronouncing any words because of problems with your teeth, mouth or dentures?	3 (9.1)	1 (6.1)	4 (12.1)	6 (18.2)	7 (21.2)	11 (33.3)	2.73 $\pm$ 1.68
Food catching in your teeth or dentures?	5 (15.2)	2 (9.1)	4 (12.1)	6 (18.2)	2 (6.1)	13 (39.4)	2.91 $\pm$ 1.89
Feeling that your dentures have not been fitting properly?	6 (18.2)	1 (6.1)	4 (12.1)	2 (6.1)	10 (30.3)	9 (27.3)	2.94 $\pm$ 1.87
Painful aching in your mouth?	4 (12.1)	2 (9.1)	2 (6.1)	8 (24.2)	4 (12.1)	12 (36.4)	2.76 $\pm$ 1.77
Uncomfortable experience to eat because of problems with your teeth, mouth or dentures?	9 (27.3)	2 (9.1)	4 (12.1)	2 (6.1)	4 (12.1)	11 (33.3)	3.33 $\pm$ 2.1
Sore spots in your mouth?	1 (3.0)	2 (9.1)	3 (9.1)	6 (18.2)	7 (21.2)	13 (39.4)	2.36 $\pm$ 1.48
Uncomfortable dentures?	3 (9.1)	2 (9.1)	6 (18.2)	5 (15.2)	11 (33.3)	5 (15.2)	2.7 $\pm$ 1.40
Worries caused by dental problems?	3 (9.1)	5 (18.2)	5 (15.2)	1 (3.0)	4 (12.1)	14 (42.4)	2.82 $\pm$ 1.89
Been self-conscious because of your teeth, mouth or dentures?	6 (18.2)	3 (12.1)	1 (3.0)	3 (9.1)	1 (3.0)	18 (54.5)	4.3 $\pm$ 2.1
To avoid eating some foods because of problems with your teeth, mouth or dentures?	6 (18.2)	3 (12.1)	3 (9.1)	4 (12.1)	7 (21.2)	9 (27.3)	3.88 $\pm$ 1.9
Been unable to eat with your dentures because of problems with them?	3 (9.1)	6 (21.2)	3 (9.1)	5 (15.2)	6 (18.2)	9 (27.3)	3.94 $\pm$ 1.77
To interrupt meals because of problems with your teeth, mouth or dentures?	5 (15.2)	3 (12.1)	4 (12.1)	3 (9.1)	9 (27.3)	8 (24.2)	3.06 $\pm$ 1.82
Been upset because of problems with your teeth, mouth or dentures?	2 (6.1)	5 (18.2)	3 (9.1)	8 (24.2)	4 (12.1)	10 (30.3)	2.91 $\pm$ 1.66
Been a bit embarrassed because of problems with your teeth, mouth or dentures?	6 (18.2)	2 (9.1)	1 (3.0)	3 (9.1)	1 (3.0)	19 (57.6)	2.27 $\pm$ 1.91
Avoided going out because of problems with your teeth, mouth or dentures?	0 (0)	2 (9.1)	2 (6.1)	4 (12.1)	4 (12.1)	20 (60.6)	1.91 $\pm$ 1.36
Been less tolerant of your spouse or family because of problems with your teeth, mouth or dentures?	1 (3.0)	1 (6.1)	2 (6.1)	2 (6.1)	2 (6.1)	24 (72.7)	1.76 $\pm$ 1.44
Been a bit irritable with other people because of problems with your teeth, mouth or dentures?	0 (0)	2 (9.1)	1 (3.0)	1 (3.0)	3 (9.1)	25 (75.8)	1.61 $\pm$ 1.27
Been unable to enjoy other people's company as much because of problems with your teeth, mouth or dentures?	3 (9.1)	4 (15.2)	2 (6.1)	4 (12.1)	1 (3.0)	18 (54.5)	2.52 $\pm$ 1.89
Felt that life in general was less satisfying because of problems with your teeth, mouth or dentures?	2 (6.1)	3 (12.1)	2 (6.1)	3 (9.1)	6 (18.2)	16 (48.5)	2.33 $\pm$ 1.69

\* Source: Allen and Locker, (2002).

¥ Scale ranges from 1 ("never") to 6 ("always").

**Table 5** Correlation between denture quality parameters and OHIP-20.

Denture quality parameter	Correlation	p-Value
Esthetic lip support	0.15	0.440
Esthetic lower lip line	−0.09	0.628
Stability of maxillary denture	−0.47	0.009*
Stability of mandibular denture	−0.45	0.0023*
Retention of maxillary denture	−0.26	0.169
Retention of mandibular denture	−0.34	0.092
Occlusion	−0.21	0.250

Point-biserial correlation coefficient.

\* Correlations larger than  $r = 0.40$  are statistically significant at  $p < .05$ .

treatments for improving the stability and retention of complete dentures and the patient's QoL continues to grow (Naert et al., 1988; Burns et al., 1995; Awad et al., 2000, 2003; Walton et al., 2009; Alfadda et al., 2009). Dental implants should be considered, particularly for patients who psychologically cannot adapt to being edentulous and for

elderly patients receiving their first complete denture set at an advanced age when neuromuscular adaptation is diminished.

Although the evidence is not yet conclusive, an array of factors in addition to the technical quality of the dental treatment are thought to play a role in determining the patient QoL. Other factors that have been reported to affect perceived QoL include age, tooth loss, cultural differences (Steele et al., 2004), the patient's anxiety toward dental treatment (McGrath and Bedi, 2004), the ability of the patient to cope with the stress of dental treatment (Heydecke et al., 2004), and the presence of prosthetic stomatitis (Perea et al., 2013). Hence, in addition to professional considerations and socioeconomic status, the concerns and demands of the patient are key when considering prosthetic therapy (Budtz-Jørgensen, 2001). Clinicians should allow sufficient time during dental visits to listen attentively to the patient's complaints, concerns, and expectations. Addressing the needs of the patient will most likely lead to their satisfaction and positively affect their QoL. Allen and McMillan reported that the QoL score was only moderately improved in patients who requested



an implant-supported overdenture but could not receive the requested treatment (Allen and McMillan, 2003). However, the QoL for patients who received their treatment of choice was significantly improved. These findings further affirm the significance of identifying and addressing the patient's concerns and demands as an integral part of any dental treatment.

## 5. Conclusion

The stability of the maxillary and mandibular dentures is the denture quality parameter that can most significantly affect patient quality of life.

## Financial support

None.

## Conflict of interest

The authors have no conflict of interest to declare.

## Acknowledgements

The authors wish to express their gratitude to the dental students at the College of Dentistry, King Saud University for their help in patients' recruitment. Many thanks to Mr. N. AL-Mafhehi for his contribution to statistical analysis.

## References

- Adam, R.Z., 2006. Do Complete Dentures Improve the Quality of Life of Patients? (Thesis) University of Western Cape.
- Agerberg, G., Carlsson, G.E., 1981. Chewing ability in relation to dental and general health: analyses of data obtained from a questionnaire. *Acta Odontol.* 39 (3), 147–153.
- Alfadda, S.A., Attard, N.J., David, L.A., 2009. Five-year clinical results of immediately loaded dental implants using mandibular overdentures. *Int. J. Prosthodont.* 22 (4), 368–373.
- Allen, F., Locker, D., 2002. A modified short version of the oral health impact profile for assessing health-related quality of life in edentulous adults. *Int. J. Prosthodont.* 15 (5), 446–450.
- Allen, P.F., McMillan, A.S., 2003. A longitudinal study of quality of life outcomes in older adults requesting implant prostheses and complete removable dentures. *Clin. Oral Implants Res.* 14 (2), 173–179.
- Anastasiadou, V., Robin Heath, M., 2006. The effect of denture quality attributes on satisfaction and eating difficulties. *Gerodontology* 23 (1), 23–32.
- Awad, M.A., Locker, D., Korner-Bitensky, N., Feine, J.S., 2000. Measuring the effect of intra-oral implant rehabilitation on health-related quality of life in a randomized controlled clinical trial. *J. Dent. Res.* 79 (9), 1659–1663.
- Awad, M.A., Lund, J.P., Dufresne, E., Feine, J.S., 2003. Comparing the efficacy of mandibular implant-retained overdentures and conventional dentures among middle-aged edentulous patients: satisfaction and functional assessment. *Int. J. Prosthodont.* 16 (2), 117–122.
- Barrett, G.D., 1978. Evaluation of Proposed Quality Assessment Criteria for Complete Denture Treatment (Thesis). University of Michigan.
- Bernier, S., Shotwell, J., Razzoog, M., 1984. Clinical evaluation of complete denture therapy: examiner consistency. *J. Prosthet. Dent.* 51 (5), 703–708.
- Brennan, M., Houston, F., O'Sullivan, M., O'Connell, B., 2010. Patient satisfaction and oral health-related quality of life outcomes of implant overdentures and fixed complete dentures. *Int. J. Oral Maxillofac. Implants* 25 (4), 791–800.
- Brunton, P.A., McCord, J.F., 1993. An analysis of nasolabial angles and their relevance to tooth position in the edentulous patient. *Eur. J. Prosthodont. Restor. Dent.* 2 (2), 53–56.
- Budtz-Jørgensen, E., 2001. *Prosthodontics for the Elderly: Diagnosis and Treatment*, vol. 10. No. 2. Quintessence Publishing.
- Burns, D.R., Unger, J.W., Elswick Jr., R.K., Beck, D.A., 1995. Prospective clinical evaluation of mandibular implant overdentures: Part I – Retention, stability, and tissue response. *J. Prosthet. Dent.* 73 (4), 354–363.
- Carlsson, G.E., 1998. Clinical morbidity and sequelae of treatment with complete dentures. *J. Prosthet. Dent.* 79 (1), 17–23.
- Chaytor, D., 2004. In: Zarb, G.A. (Ed.), *Diagnosis and Treatment Planning for Edentulous or Potentially Edentulous Patients, Prosthodontic Treatment for Edentulous Patients. Complete Dentures and Implant-Supported Prostheses*. Mosby, St. Louis, pp. 73–99.
- de Souza e Silva, M.E., de Magalhaes, C.S., Ferreira e Ferreira, E., 2009. Complete removable prostheses: from expectation to (dis)satisfaction. *Gerodontology* 26 (2), 143–149.
- Ellis, J.S., Pelekis, N.D., Thomason, J.M., 2007. Conventional rehabilitation of edentulous patients: the impact on oral health-related quality of life and patient satisfaction. *J. Prosthodont.* 16 (1), 37–42.
- Heartwell, C.M., Rahn, A.O., 1986. *Syllabus of Complete Denture*. Lea & Febiger.
- Heydecke, G., Tedesco, L.A., Kowalski, C., Inglehart, M.R., 2004. Complete dentures and oral health related quality of life – do coping styles matter? *Community Dent. Oral Epidemiol.* 32 (4), 297–306.
- John, M.T., Slade, G.D., Szentpetery, A., Setz, J.M., 2004. Oral health-related quality of life in patients treated with fixed, removable, and complete dentures 1 month and 6–12 months after treatment. *Int. J. Prosthodont.* 17 (5), 503–511.
- McGrath, C., Bedi, R., 2004. The association between dental anxiety and oral health related quality of life in Britain. *Community Dent. Oral Epidemiol.* 32 (1), 67–72.
- Naert, I., De Clercq, M., Theuniers, G., Schepers, E., 1988. Overdentures supported by osseointegrated fixtures for the edentulous mandible: a 2.5-year report. *Int. J. Oral Maxillofac. Implants* 3 (3), 191–196.
- World Health Organization, 2001. [3] International Classification of Functioning, Disability, and Health (ICF).
- World Health Organization, 2003. Recommendations for Preventing Dental Diseases. From <[http://www.who.int/oralhealth/publications/orh\\_cdoe05\\_vol33.pdf](http://www.who.int/oralhealth/publications/orh_cdoe05_vol33.pdf)> .
- Perea, C., Suárez-García, M.J., Del Río, J., Torres-Lagares, D., Montero, J., Castillo-Oyagüe, R., 2013. Oral health-related quality of life in complete denture wearers depending on their socio-demographic background, prosthetic-related factors and clinical condition. *Med. Oral Patol. Oral Cir. Bucal* 18 (3), e371.
- Reisine, S.T., 1988. The impact of dental conditions on social functioning and the quality of life. *Annu. Rev. Public Health* 9, 1–19.
- Sheiham, A., Croog, S.H., 1981. The psychosocial impact of dental diseases on individuals and communities. *J. Behav. Med.* 4 (3), 257–272.
- Steele, J.G., Sanders, A.E., Slade, G.D., Allen, P.F., Lahti, S., Nuttall, N., Spencer, A.J., 2004. How do age and tooth loss affect oral health impacts and quality of life? A study comparing two national samples. *Community Dent. Oral Epidemiol.* 32 (2), 107–114.
- Walton, J.N., Glick, N., Macentee, M.I., 2009. A randomized clinical trial comparing patient satisfaction and prosthetic outcomes with mandibular overdentures retained by one or two implants. *Int. J. Prosthodont.* 22 (4), 331–339.

- Watt, D.M., MacGregor, A.R., 1976. *Designing Complete Dentures*. Saunders.
- Wolff, A., Gadre, A., Begleiter, A., Moskona, D., Cardash, H., 2003. Correlation between patient satisfaction with complete dentures and denture quality, oral condition, and flow rate of submandibular/sublingual salivary glands. *Int. J. Prosthodont.* 16 (1), 45–48.
- Yoshida, M., Sato, Y., Akagawa, Y., Hiasa, K., 2001. Correlation between quality of life and denture satisfaction in elderly complete denture wearers. *Int. J. Prosthodont.* 14 (1), 77–80.